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NEW TRENDS IN TECHNOLOGY, AND THEIR APPLICATIONS: HYDROGRAPHY

Accurate and detailed navigational charts: essential basis for maritime trade in East Asia and the Pacific

Paper submitted by the International Hydrographic Bureau

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Background

At the 12th UN Regional Conference for Asia and the Pacific the International Hydrographic Organization presented no less than eight papers dealing with its activities and the need for hydrography in the Region. Following the discussions concerning these papers, two Resolutions were approved by the Conference dealing specifically with hydrographic interests. The Resolutions were as follows:-

A. Hydrographic Surveying and Nautical Charting Services

1. Recommends that countries without adequate charting capabilities should request the IHO to provide expert advice on the preparation of a Project Formulation Framework for the development of a hydrographic service suited to their requirements and existing resources;

2. Further recommends that the United Nations Economic and Social Commission for Asia and the Pacific, in conjunction with the IHO and appropriate Asian and Pacific institutions, should:

i) Prepare a Project Formulation Framework for a hydrographic survey of the South China Sea with the assistance of the Regional East Asia Hydrographic Commission, UNDP and other donor agencies;

ii) Explore the possibility of preparing projects and, if practical, to prepare projects to strengthen existing regional centres such as the Committee for Co-ordination of Joint Prospecting for Mineral Resources in Asian and Pacific Offshore Areas (CCOP), in order to provide capabilities to maintain hydrographic equipment and to train maintenance and nautical cartographic personnel from countries in the Region;

iii) Sponsor a hydrographic surveying seminar/workshop for senior administrators from Asia and the Pacific.

3. Further recommends that the United Nations Department of Technical Cooperation for Development, in conjunction with the United Nations Economic and Social Commission for Asia and the Pacific and the International Hydrographic Organization should:

i) Consider creating a post of United Nations/IHO Regional Hydrographic Technical Adviser at the U.N. ESCAP Secretariat;

ii) Consider the award of fellowships to suitable students from developing countries to attend courses in hydrographic surveying and nautical charting.

iii) Report progress at the 13th United Nations Regional Cartographic Conference for Asia and the Pacific.

B. Status of Hydrographic Surveying and Nautical Charting

1. Requests the United Nations Department of Technical Co-operation for Development to distribute IHO Publication SP-55 as widely as possible;

2. Recommends that coastal States in Asia and the Pacific Region should give urgent study to the IHO Publication SP-55 "Status of Hydrographic Surveying and Nautical Charting Worldwide, First Edition, Jan. 1991" and should report any changes required and any new information needed to complete the Report so as to reach the International Hydrographic Bureau, in Monaco, by 1 January 1992;

3. Requests the International Hydrographic Organization to issue updated editions of its publication SP-55 at regular, two-year intervals and report on the Status of hydrographic surveying and nautical charting to the 13th United Nations and Regional Cartographic Conference for Asia and the Pacific.

Three years later we are able to trace the progress made both to satisfy the fulfillment of these Resolutions and also to identify the economic trends in the Region with respect to maritime trade and also the progress in hydrography and navigational charting.

Shipping

The major increase in economic prosperity in East Asia is indisputable. Whether this also extends to the Pacific island countries and into western Asia may be questioned. The Gulf war undoubtedly resulted in a perturbation to the economics of countries in that area but in South East Asia a visit to any of the great cities will convince even the most casual observer of the increasing prosperity. Further north, where perhaps the Japanese economy may be seen to slow down, the Chinese economy is picking up at a fast pace.

For coastal, and particularly for island states there is a clear relationship between the overall economy and the growth of marine transportation. Recent papers describe the growth in merchant shipping fleets and the carriage of commodities in the region. This is particularly the case for ASEAN countries where it has been estimated that some 80% of the total external trade, comprises seaborne trade. The steady increase in the volume of cargoes carried and consequently the amount and size of shipping is evident in the major seaports, such as Singapore, Hong Kong and the Tokyo area.

Hydrographic Surveys and Charting

Although there is considerable activity by established national Hydrographic Offices in the region the overall progress of improving the navigational charts has been slow and there are no significant changes from the status of hydrographic surveying and nautical charting as reported at the previous Conference. The International Hydrographic Organization (IHO) continues to express its concern for the state of knowledge of such major trading thoroughfares as the South China Sea. A recent matter proposed for the attention of the Sub committee on the Safety of Navigation of the International Maritime Organization (IMO) has been a proposal to extend the traffic routeing system in the Malacca Straits. Such a proposal requires new hydrographic surveys of some of the shoal areas along the proposed routes. The proposal was made by the Oil Companies International Maritime Forum (OCIMF). The Malacca Straits and Singapore have been stated to be the busiest in the world after the Dover Straits and attention to their navigational safety must take high priority. Earlier attention to this matter was given in 1969-74 when the Malacca Straits Council, Japan and three coastal states combined their efforts to carry out detailed surveys and produce new charts. As shipping increases the need to improve these maritime highways increases.

While highly critical areas such as the Malacca Straits become obviously in need of attention there are many many other areas where the data is sparse and possibly inaccurate in terms of modern standards. While many vessels may safely transit the South China Sea and the numerous channels passing through the Indonesian and Philippine archipelagoes it takes but one serious accident to cause not only loss of life and property but considerable disruption to economies depending upon the sea such as fishing and tourism. The latter, in particular, is an important new source of revenue to several countries in the region and clearly disastrous maritime accidents resulting in pollution will cause major setbacks to their well being.

At present, collisions are the dominant cause of marine accidents but the statistics reveal that there are also many accidents resulting from groundings, often occurring during the typhoons which sweep the area. It has also been explained how there is a relationship between the establishment of traffic separation routes that are designed to encourage the free and safe flow of shipping and the need for improved hydrographic knowledge.

Problems of Datums

A problem that has been introduced by the advent of new technology concerns reference to horizontal datums. The majority of today's charts are still referenced to local or regional datums. Satellite systems used to navigate ships are referenced to geocentric worldwide datums. Previously the Navy Navigation Satellite System was referenced to World Geodetic System (WGS) 72 and today the Global Positioning System (GPS) is referenced to WGS-84. Consequently the differences between the position the navigator may obtain by reference to the chart and that obtained from the satellite receiver may be significantly different. Although the IHO has resolved that all charts should have a legend pointing out this difference to navigators and in the case of new charts that they should actually be constructed on WGS-84 datum, major problems still exist. On the one hand the task of recompiling the many charts (3000 is the world wide UK Admiralty chart coverage) will, using present technology, take many many years. On the other hand there are countries in the Region which are bound by their national laws to produce all charts referenced to their national datums and not to the World Geodetic System.

Looking at these matters more positively the satellite technology will now not only permit the offshore surveys to be carried out with much greater accuracy than previously but it will be also possible to improve the overall geodetic framework. Such programmes have recently been reported as ongoing in several countries in East Asia. Such technology will also permit the numerous scattered islands in the Pacific Ocean to be brought together in a common geodetic frame.

Electronic Charting

Another new technology is having major effects in navigational charting. This is the introduction of Electronic Chart Display and Information Systems(ECDIS). Interest in this technology developed in the early 1980's as a development from simple chart plotting devices. The IHO, working with the IMO has developed precise performance standards for the development of ECDIS. Under these standards it will be possible for ships to carry the electronic equivalent of a paper chart. These systems will in fact, be a type of marine geographical information system that can be used for navigation. In September 1993 the Sub-Committee on the Safety of Navigation of IMO recommended the Performance Standards for ECDIS to be approved by the parent body. The approval process is expected to take about two years with a target of 1995 for their final approval.

The development of this new technology has put a major pressure on national Hydrographic Offices to develop the digital chart data for the ECDIS. The IHO has spent several years in developing a detailed exchange standard that must be used in transferring the digital data between the HO's and between them and the ECDIS users. The standard, which primarily consists of an object code and an exchange format, is complex and demanding but is considered to provide data that will satisfy all the needs of the navigator using ECDIS. National HO's have now started the major task of capturing the digital data. In most case this is being achieved by digitizing the paper charts. There is a definite problem in this procedure when the original paper charts are the result of old and inaccurate surveys and also when they are referenced to non-geocentric datums, as discussed previously.

In this region the Japanese Maritime Safety Agency has embarked on a major programme aimed at producing digital data for all Japanese coastal waters by 1995. Work on the development of ECDIS has also been reported from China. Shipping is an international business and the data base for ECDIS must be extended to cover all major shipping routes and eventually all maritime areas.

Activities of the International Organization in Asia and the Pacific

One of the important organizational mechanisms of the IHO is its Regional Commissions. At present it has nine of these of which there are now two covering our present area of interest. The East Asia Regional Hydrographic Commission was established in 1971 and its present chairman is the Malaysian Hydrographer. During 1993 a new Commission was inaugurated for the South West Pacific, with Australia providing the chairman. The Regional Commissions provide an important forum for information exchange, covering all areas of hydrography. In western Asia, where there has latterly been a surge in interest in hydrography, several countries are now in the process of joining the IHO and it is clear that the formation of another Regional Commission would be useful.

The IHO continues to promote the idea of a South China Sea project directed at providing a coordinated effort to greatly improve the charts of this much travelled area. To attract the interest of any of the international funding agencies it requires the solid support of all countries surrounding the area. Issues of sovereignty are thought to be the cause of less than total commitment to this project. Also the fact that improved charts will mainly benefit international through traffic rather than the coastal states, undoubtedly has an effect on how the coastal states will weigh the necessary offshore surveys in their priorities.

In view of the proposed extension of the traffic separation routes in the Malacca Straits the coastal states are being asked to carry out surveys of certain shoal areas. However they may well ask if that is their responsibility or the responsibility of the flag states of the international shipping. The fact that such a proposal was raised by the Oil Companies International Marine Forum should introduce the question of should the user pay. Japan's early initiative to assist in hydrographic work may well be repeated but should this obligation extend to all flag states whose shipping transits this and other international waterways ?

The East Asia Regional Hydrographic Commission has been responsible for arranging several useful workshops and seminars for the exchange of information. A recent seminar, held in Tokyo in November 1994, addressed the problems of horizontal datums for charts that was discussed earlier. Although the solutions were not immediately forthcoming, the identification of the problem and the discussion of the progress by the HO's in the Region were well worthwhile.

An important and major long range programme of the IHO is the development of the INTernational chart. It was realized over twenty five years ago that there was considerable duplication of effort in the production of charts by different nations. Spurred on by reasons of sovereignty HO's produced charts of their own and other country's seas but in so doing the work was often duplicated with several HO's charting the same areas. While there is a need to produce charts in languages that are familiar to the user, there is little need to duplicate the compilation of the data itself. In order to overcome this problem a system was set up to produce one unique set of charts to cover all the seas of the world. The first step was to produce a unique chart scheme and the second step was for individual HO's to volunteer to provide a compilation of the original chart for each element of the scheme. Other HO's could then make copies of the compilation, adding their own language or other details that they wished. In order to develop the scheme Regional International Chart Committees were formed to decide on different regional components of the scheme. During recent years such components have been finalized for East Asia and the Western Pacific. One further matter that had to be decided was the financial terms under which data could be exchanged between HO's. This matter is associated with the copyright which is exercised by most HO's on their products. Arrangements are now coming into place that will permit HO's to be satisfactorily re-imbursed for their data and work and it is now hoped that this programme will move quickly ahead in East Asia and the Pacific as it has done to date in Europe. It requires the active participation of HO's in the Region to volunteer to produce the original compilations and charts.

Yet another important charting matter to be considered is the development of digital chart data, that was also discussed earlier. The work already in progress in Japan has been noted. To this might be added the significant work that has been carried out in Australia in participating in the development of standards and the technology itself. It is now necessary for the technology to be spread throughout the HO's in the region and the work be carried out to capture the digital data. Initiatives are in hand to set up a workshop in order to transfer the knowledge required to codify and prepare digital data according to the IHO Digital Data Transfer Standard. Another interesting proposal from the ASEAN HO's that deserves support is a Proposed ASEAN Maritime Operations Management Project. This project is directed at providing improved Vessel Traffic Management in the area. One of the elements of this is to develop the role of ECDIS in this activity. To achieve this it will be necessary to develop a digital data base by digitizing charts along routes linking selected seaports in the ASEAN countries.

At some future stage it will be necessary for the HO's in East Asia and the Western Pacific to decide how they can link their services with respect to ECDIS, to provide a regional rather than independent national services. Although, naturally, national shipping will expect to be served by national resources, when it comes to international shipping it will require internationally coordinated products, probably on a regional basis. Charts, whether they be paper or digital, need to be constantly updated. With the paper products this is achieved by providing Notices to Mariners, which are themselves a paper product that must be delivered to shipping agents by mail. With electronic products this is an unsatisfactory means of providing the service. Greatly improved communication networks will allow updates to be rapidly moved from HO to the user, either at sea or in port. With such media available it seems almost mandatory that such services must be coordinated by individual HO's into regional packages so that to the ship at sea, it is transparent from where the updates of its charts were obtained. Such is the organization that will be required for the future.

Financing

Finally let us turn to the important matter of financing for all the hydrographic work that is needed for the future. There was a time when the provision of hydrographic services was strongly linked with a nation's position as a trading power. With the growth of flags of convenience for shipping, this relationship does not today necessarily exist. There are several major flag states that support insignificant hydrographic capabilities. On the other hand there are many coastal states that are obliged to carry out hydrographic surveys and produce charts which are primarily used by international shipping, which may not necessarily call at its ports. If any truly significant advances are to be made to improve the global state of nautical charting it seems necessary to re-examine the financing of hydrography on the basis of user pay. Large funds have been established to pay for the costs of clean up following marine accidents resulting in marine pollution. It seems that it would be far better if , at least some portion of these funds were used to support activities that would prevent accidents rather than to pay for the results of the pollution following the accidents.

Conclusions

Referring to the Resolutions related to hydrography and nautical charting which were adopted during the 12th UN Regional Cartographic Conference for Asia and the Pacific in 1991 the major actions taken by the IHO were as follows:

1. IHO Publication 55 "Status of Hydrographic Surveying and Nautical Charting Worldwide"

This publication has found wide distribution and is frequently referenced in other publications.

According to the responses to a questionnaire distributed to IHO Member States, lists and tables of this publication were updated. The updates were communicated to the UN Department of Technical Co-operation for Development. It should be noted that no significant improvement of the status could be stated, i. e. the overall situation remained practically unchanged; this applies also to the Asia and Pacific region.

2. South China Sea Project

The initial Project Document has been continually updated, mainly by close co-operation of littoral states coordinated by the HO of the Philippines.

To date the Project is still awaiting implementation as no donor countries nor organizations could be found.

3. ASEAN Maritime Operations Management Project

This project has been jointly initiated by the HO's of the ASEAN countries. Its principal aims are the enhancement of safety of navigation and the reduction of risks of oil pollution by creating the basis for and introduce modern systems for the management of maritime traffic. This requires the establishment of ECDIS Data Bases and the subsequent creation of Vessel Traffic Management (VTS) systems in and between major ports of the region.

Funding of this project remains at present a crucial issue.

4. International Bathymetric Chart of the Western Pacific (IBCWP)

This project is an initiative of the regional WESTPAC organization of the (IOC) Intergovernmental Oceanographic Commission. It is planned to produce a large series of 1: 1 million scale bathymetric maps covering the entire western Pacific Ocean. IHO Member States are actively participating in this endeavour.

5. Technical Assistance

The IHO is continuing its efforts to provide technical assistance, also to non-Member States. Actions concentrated on finding sources to finance projects and on training. The European Community (EC) has recently been contacted to investigate the possibility of EC funding for projects. An EC funded project has recently been executed in the south-west Pacific by a French vessel equipped with a swathe sounding system.